Optimization of image fusion in permanent prostate implants

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Introduction. In Permanent Prostate Implants (PPI) with radioactive seeds a post-plan is required after completion of the implant. To calculate the post-plan it is required to register two imaging studies and the automatic search for the position of the seeds. *Purpose*. To improve process efficiency in the post-plan after a PPI (exact location of the implanted seeds, reliability of the registration and decrease in time).
Material and method. Certain variables used in the planning system (PS) for image registration and automatic search of seeds were determined. The PS used was SPOT PRO v3.0 by Nucletron. The method employed to make image registration was point matching. Quantitative result shown by the Root Mean Square (RMS). Image registration was performed in ten patients by two Radiation Oncologists (RO) One of the RO performed the registration using both three and four points. Different threshold values were introduced in Hounsfield Units (HU) for seeds and bone with the maximum and minimum area of the image of a seed. The coincidence between the number of seeds implanted and those detected by the PS were analyzed.
Results. The average measure of intraclass correlation coefficient (ICC) using an ANOVA model two-way random with absolute agreement is 0.857 (95% CI: 0.427–0.965) to RMS of record measured by two Radiation Oncologists and 0.740 (95% CI: 0.000–0.938) to RMS of record measured using three and four points for matching.
Conclusion. The reliability of the image registration allows the use of only three points for matching. The result is independent of the doctor who performs it. The best results to automatically search for the seed by the PS were obtained with the values of 1000 HU to seed threshold, 150 HU to bone threshold, 0.5 mm^2 to minimum spot area and 50 mm^2 to maximum spot area.

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Outcome and toxicity using interstitial-MRI Utrecht applicator in cervical brachytherapy

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Introduction. GEC-ESTRO recommendations for IGRT in brachytherapy, the incorporation of MRI in the planning and new MRI-compatible applicators have improved our treatments. But, in big tumours, intrauterine applicators do not seem enough in order to reach a good coverage. Interstitial CT-MRI Utrecht (Nucletron®) applicator with plastic needles lets improve HR-CTV and IR-CTV coverage sparing organs at risk.
Objective. To review clinical outcomes, toxicity and dosimetry in patients with cervix tumours using interstitial CT-MRI Utrecht applicator.
Material and methods. Retrospective review of the records of 52 cervical cancer patients treated in our institution from February 10 to October 12. To be included in the study, the treatment had to fulfill the criteria: (1) include a previous treatment of at least 45 Gy of EBRT to the pelvis concomitant with cisplatin; (2) the BT boost consisted in insertion of a interstitial Utrecht applicator under spinal anesthesia and individualized MRI planning. Each treatment was composed of 2 applications (7 days apart), with 2 separated fractions of ~7Gy (in 24 h). Toxicity scores were defined by CTCAE v3.0.
Results. 41/52 patients have available data. In most of them 6 needles were inserted. The final average biologically equivalent doses (EQD2) were: D90 HR-CTV = 86.4 Gy; D90 IR-CTV = 66.3 Gy; 2 cm^3 maximum dose for bladder was 74.4 Gy and 63.4 Gy and 58.2 Gy respectively for rectum and sigmoid. 4 patients presented haemorrhage when application was removed. Median follow-up was 19 months (3–35). GU and GI $G \geq 3$ toxicities occurred in 2 (4.8%) and 1 (2.4%) patients respectively. 6 (14.6%) patients developed systemic failure, but only 3 (7.3%) patients experienced local relapse, associated with large tumours with poor response to EBRT. Cancer specific survival was 92.6%.
Conclusions. Our results suggest that interstitial IGBT as recommended by the GEC-ESTRO, is safe, in terms of local control and morbidity. These clinical and dosimetric results compare favourably with the traditional technique.

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Perioperative interstitial high-dose-rate brachytherapy in tongue carcinoma

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Abstract purpose. To evaluate the results of perioperative interstitial high-rate-dose brachytherapy (PIHB) in patients with tongue carcinoma.
Materials and methods. Between June 2003 and January 2013, 34 patients with tongue carcinoma were treated with partial glossectomy and PIHB. In 21 cervical lymph node dissection was performed as well. Median age was 62 (24–93). Eleven patients were stage pT1, nineteen pT2 and four pT3, with lymph node involvement in 12 of them. EBRT 50–60 Gy was administrated to 40% of the patients, and 4 received chemotherapy. The brachytherapy technique used plastic tubes, implanted in the surgical bed just